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10/583,523	07/24/2007	Masum Choudhury	A5-013 US	1436

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MOLEX INCORPORATED
2222 WELLINGTON COURT
LISLE, IL 60532

EXAMINER

BEDTELYON, JOHN M

ART UNIT	PAPER NUMBER
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2874

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06/09/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/583,523	Applicant(s) CHOUDHURY ET AL.	
	Examiner JOHN M. BEDTELYON	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 March 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,10-14,16,19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,10-14,16,19 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 November 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This action is responsive to the amendment and remarks submitted 03/16/2010. Claims 1, 8, 14 and 16 are amended. Claims 2, 9, 15, 17 and 18 are canceled. No claims are newly added. Claims 1, 3-8, 10-14, 16, 19 and 20 are currently pending in the Application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3, 4, 7, 8, 11-14, and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Luo et al. (US Patent 7,251,406, hereinafter Luo).

Luo teaches:

Claim 1: a core (206, 207) formed of a single material on a planar substrate structure (201), the core having first (upper right side of portion 205, as seen in figure 2a) and second (lower left side of portion 205, as seen in figure 2a) ends, a top surface (uppermost surface), side surfaces (side edges of 206) and a flat (bottommost surface), planar bottom surface, the flat, planar bottom surface (the bottommost surface of 206) being disposed adjacent said planar substrate structure (see figure 2a),

a predetermined plurality of steps (see figure 2a, the steps formed by portions 206 and 207) formed into the top surface by dry etching (column 8, lines 49-51) the waveguide extension so as to vertically and horizontally taper said waveguide extension between the first and second ends (see figure 2a), each of the steps having predetermined height and length;

wherein the side surfaces (sides of 206) comprise a flat surface (each of the side surfaces of 206 are flat surfaces, see figure 2a) from the first end of the core to the second end of the core to create a single, uniform, horizontal taper between the first and second ends (see figure 2a, the side surfaces of portion 206 have a single, uniform, and smooth taper from the first to the second end).

Claim 3: wherein the vertical and horizontal tapers narrow at the same end of the core (see figure 2a).

Claim 4: the device further comprising a dielectric cladding layer (202, column 8, lines 63-66) formed over the core (see figure 2a).

Claim 7: further comprising dielectric layers formed under and over the core, wherein the dielectric layers each have a refractive index that is lower than the refractive index of the core (202 and the corresponding upper cladding, not shown in the figures, column 6, lines 31-43).

Claim 8: a planar waveguide (204); and

a tapered waveguide extension (205) formed at an end of the planar waveguide for coupling light between the planar waveguide and an optical fiber (see figure 2a), the waveguide extension having a core (206, 207) formed of a single material on a planar

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substrate structure (201), the core having first (upper right side of portions of each of portions 206 and 207, as seen in figure 2a) and second (lower left side of portion 206 and the lower left side of portion 207 are each interpreted as second ends, as seen in figure 2a) ends, a top surface (uppermost surface), side surfaces (side edges of 206) and a flat (bottommost surface), planar bottom surface opposite the top surface and positioned adjacent the planar substrate structure (see figure 2a), a predetermined plurality of steps (see figure 2a, the steps formed by portions 206 and 207) formed into the top surface by dry etching (column 8, lines 49-51) the waveguide extension so as to vertically and horizontally taper the waveguide extension between the first and second ends (see figure 2a), each of the steps having predetermined height and length and being formed such that an edge of each step is parallel to the first and second ends of the core (see figure 2a, the edges of the 207 portion of the core are parallel to the edges of the 207 portion of the core at the first and second ends, and the edges of the 206 portion of the core are parallel to the edges of the 206 portion of the core at the first and second ends), and the side surfaces (sides of 206) each comprising a flat surface from the first end of the waveguide extension to a second end of the waveguide extension to create a single, uniform, horizontal taper (see figure 2a, the side surfaces of portion 206 have a single, uniform, and smooth taper from the first to the second end and are flat surfaces).

Claim 11: the device further comprising a dielectric cladding layer (202, column 8, lines 63-66) formed over the core (see figure 2a).

Claim 12: further comprising dielectric layers formed under and over the core, wherein the dielectric layers each have a refractive index that is lower than the refractive index of the core (202 and the corresponding upper cladding, not shown in the figures, column 6, lines 31-43).

Claim 13: further comprising the optical fiber (208).

Claim 14: (a) providing a planar substrate material (201);

(b) forming a core layer (203) of core material for the tapered waveguide on the planar substrate material, the core layer having first (the upper right end of both portions 206 and 207 as seen in figure 2a) and second (the lower left ends of both portions 206 and 207 are interpreted as second ends, as seen in figure 2a) ends, a top surface (the top surface of 207), and a flat, planar bottom surface (the bottommost surface of 206) opposite said top surface (see figure 2a):

(c) forming the first and second ends of the core layer so that the first end is wider than the second end (see figure 2a);

(d) forming sidewalls (sides of layer 206) of the core layer so that they are flat and extend between the first end and the second end to create a single, uniform, horizontal taper between the ends (see the sides of layer 206 which are flat and form a single, uniform, horizontal taper);

(e) applying a protective layer (mask) over a predetermined area of the core layer extending from the first end towards the second end to define a protected area and leaving an unprotected area on the core layer;

(f) dry etching (column 8, lines 49-62) the unprotected area of the core layer to a predetermined depth defining a step having a height without etching through the single core material (see figure 2a) wherein an edge of the step is parallel to the first and second ends of the core layer (see figure 2a, as each portion of the core, portions 206 and 207 are interpreted to have a first and a second end, those first and second ends being the first and second ends of the core; it is interpreted that the edges of the 207 portion of the core are parallel to the edges of the 207 portion of the core at the first and second ends, and the edges of the 206 portion of the core are parallel to the edges of the 206 portion of the core at the first and second ends); and

(g) repeating steps (e) and (f) a predetermined number of times, each time extending the protected area farther from the first end to define a length of a new step so as to form a predetermined number of steps in the top surface of the core layer so as to vertically taper said core layer, each step having a predetermined height and a predetermined length (column 8, line 33 – column 9, line 28, and column 15, lines 16-22, these lines teach using etching and masking to fabricate the device of figure 2a, which would necessarily include etching unprotected parts of the waveguide, also see figure 6 which discloses repeating the masking and etching steps to create new steps).

Claim 16: wherein the step of providing said substrate further includes: providing said substrate with a dielectric layer (202) formed on the substrate, and the core layer (203) being formed on the dielectric layer (see figure 2a).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 5, 6, 10, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luo.

With respect to claim 5, Luo teaches the limitations of claim 1 as previously stated and wherein the planar substrate structure includes a dielectric layer (202) formed over a substrate (201).

Luo is silent to the substrate (201) being made of a semiconductor material.

The Examiner takes official notice that the use of a semiconductor material, particularly silicon, as the material for substrates is well known in the semiconductor substrate art with the benefit of being durable and cheap.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the substrate (201) in the Luo device out of silicon, a well known semiconductor material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. One of ordinary skill in the art would be motivated to use silicon as the material of the substrate because it is a cheap and durable material.

With respect to claims 6 and 10, Luo teaches the limitations of claims 1 and 8 as previously stated. Luo is silent to the core being made of crystalline silicon.

The Examiner takes official notice that it is well known to use crystalline silicon glass as the material of the waveguide core in the optical waveguide art, because it has the benefit of being easy to manufacture and is capable of propagating optical signals with minimal losses.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use crystalline silicon as the material of the core in the waveguide, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. One would be motivated to use crystal silicon as the material for the core because it is easy to manufacture, and is capable of propagating optical signals with minimal losses.

With respect to claims 19 and 20, Luo teaches the limitations of claim 14 as previously stated.

Luo is silent to the polishing of the wider end of the tapered waveguide or the applying an anti-reflective coating at the wider end of the tapered waveguide.

The Examiner takes official notice that the act of polishing and applying anti-reflective coatings to optical fiber connection points is well known in the optical waveguide art and is useful for lowering the amount of unwanted back reflections, which reflect light back into the optical fiber at connection points.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to polish and apply an anti-reflective coating to the wider end of the tapered waveguide because in doing so, unwanted back reflections causing signal attenuation can be reduced, increasing efficiency of the device using a simple and low cost method.

Response to Arguments

7. Applicant's arguments filed 03/16/2010 have been fully considered but they are not persuasive. The Examiner has thoroughly reviewed Applicant's arguments but believes the cited reference fully and completely meets the limitations as claimed.

Applicant first states: Applicants are confused by the Examiner's comments, which seem to indicate that the Examiner treated at least one element of the Claims of the Present Application in different respects. Specifically, in the 16 September 2009 Office Communication (in the "Response to Arguments" Section), the Examiner stated that "[a]s outlined in the Final Rejection and above, the side surfaces (referred to sidewalls in claim 14) of the core are interpreted as only the side surfaces of portion 206, and do not include the side surfaces of portion 207" (the 16 Sep 09

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Communication, p. 9). Respectfully, Applicants assert that this statement is contradictory to the Examiner's comments elsewhere in the 16 Sep 09 Communication. For example, when providing his rejection of Independent Claim 1, the Examiner states that "the waveguide extension [has] a core (206, 207) formed of a single material on a planar substrate structure (201)" (the 16 Sep 09 Communication, p. 3). Later, the Examiner states that the predetermined plurality of steps formed into the top surface of the core are represented by "the steps formed by portions 206, 207" in Figure 2a of Luo. *Id.* Thus, by these textual references, Applicants understand that the Examiner is interpreting the core of Luo to comprise reference numerals 206 and 207. In addition to the Examiner's comments on Page 9 of the 16 September 2009 Office Communication, the Examiner does contend, in his rejection, that the side surfaces are limited to reference numeral 206. However, this contention does not comport with the language of the Claims of the Present Application, which do not split the core into to separate portions. Rather, the core is disclosed, in Independent Claim 1, for example, as having, *inter alia*, being formed of a single material and having a top surface, a bottom surface and side surfaces.

The Examiner regrets the confusion of the Applicant caused by the Examiner's comments. The Examiner will clarify his position hereinafter. The Examiner respectfully disagrees that the interpretation used by the Examiner does not comport with the language of the claims. First, the Examiner would like to point out that each independent claim uses the transitional phrase "comprising" which is open-ended and does not exclude additional, unrecited elements (see MPEP 2111.03). The Examiner

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does interpret the "core" as both elements (206) and (207) taken together. The claim requires the core to have, among other things, side surfaces. The Examiner interprets the side surfaces of the portion (206) to be the "side surfaces" as named in the claim. The surfaces on the sides of the portion (207), while being surfaces of the core, which are allowed as the transitional phrase comprising is used, are not interpreted by the Examiner as the "side surfaces" as so named in the claim. To wit, the claim requires the core (elements 206 and 207 together) to have side surfaces, which the Examiner interprets as the side surfaces of the portion (206), but does not exclude additional surfaces, which would be the surfaces on the sides of portion (207).

Applicant then states: Therein lies the confusion on Applicant's part. On one hand, if the Examiner intends the disclosure of the core in Luo to be limited to reference numeral 206, then the Present Application cannot be said to read upon Luo, as reference numeral 206 does not have "a predetermined plurality of steps formed into the top surface of the core." On the other hand, if the Examiner intends the disclosure of the core in Luo to encompass reference numerals 206 and 207, then the Present Application cannot be said to read upon Luo, as the core of Luo does not have side surfaces which are "smooth from the first end of the core to the second end of the core" and "create a single, uniform, horizontal layer."

The Examiner respectfully disagrees. As previously discussed, the Examiner does interpret both portions (206 and 207) to be core. Thusly, the core is fairly interpreted to have a predetermined plurality of steps formed into the top surface of the core. Again, the side surfaces are interpreted as only the side surfaces of portion (206),

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the side surfaces of the portion (206) are smooth from the first end to the second end of the core, thusly creating a single, uniform, horizontal layer. The additional surfaces on the sides portion (207) are in addition to what is interpreted as the "side surfaces" in the claim, and is fair under proper claim construction.

Lastly, Applicant argues the Present Application cannot be said to read upon Luo, as reference numeral 206 (i.e., the core or the bottom portion of the core, depending on the Examiner's interpretations above) does not have a "planar bottom surface adjacent the planar substrate structure."

The Examiner respectfully disagrees. First, it is not clear to the Examiner why the Applicant believes the bottom surface of portion (206) does not have a "planar bottom surface adjacent the planar substrate structure." The Examiner interprets the bottom surface of the core to be the bottommost surface of portion 206, directly in contact with portion (202). This surface is interpreted by the Examiner to be a planar bottom surface adjacent the planar substrate structure (201). Viewing Figure 2a of the Luo reference, it seems likely the Applicant is purporting that the bottom surface of portion (206) is not adjacent to the planar substrate structure (201) because element (202) is between the bottom surface of (206) and the substrate (201). The Examiner disagrees. First, the term "adjacent", as defined by the Oxford American Dictionary, Heald Colleges Edition, means "lying near". Thusly, using the broadest reasonable interpretation of the claim term adjacent, the bottom surface of portion (206) can be said to be lying near the substrate structure (201), meeting the limitations of the claim. Further, the Examiner would like to point out that the device of the instant application

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(see figures 1, 2, and 5-7), in every embodiment, has an additional layer (14) between the bottom surface of the core (12) and the substrate (16), thusly Applicant does not appear to be entitled to a more narrow interpretation of the term "adjacent."

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. BEDTELYON whose telephone number is (571)270-1290. The examiner can normally be reached on Monday - Friday, 10:00am - 6:30pm EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Uyen-Chau Le can be reached on 571-272-2397. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John M Bedtelyon/
Examiner, Art Unit 2874

/UYEN-CHAU N. LE/
Supervisory Patent Examiner, Art Unit 2874